Bell Work
31-Aug-2016

For example if you weigh out gold jewelry to sell for extra cash and the scale being used reads to the decigram (XXX.Xg) and you record 28.4g at a price of $43.3/ gram, how much money should you get?

What if the actual weight was 28.44g, were you shorted?

Objective

You will be able to round number based on significant figure rules.

Significant figures

There are 2 kinds of numbers:

Exact: the amount of money in your account. Known with certainty. Anything *COUNTED*

Approximate: weight, height—anything **Measured**. No measurement is perfect.

Recall

A. Exact numbers are obtained by
    1. using a measuring tool
    2. counting
    3. definition

B. Measured numbers are obtained by
    1. using a measuring tool
    2. counting
    3. definition

Practice

Classify each of the following as an exact or a measured number.

1 yard = 3 feet

The diameter of a red blood cell is 6×10^{-4} cm.

There are 6 hats on the shelf.

Gold melts at 1064°C.

When to use Sig Figs

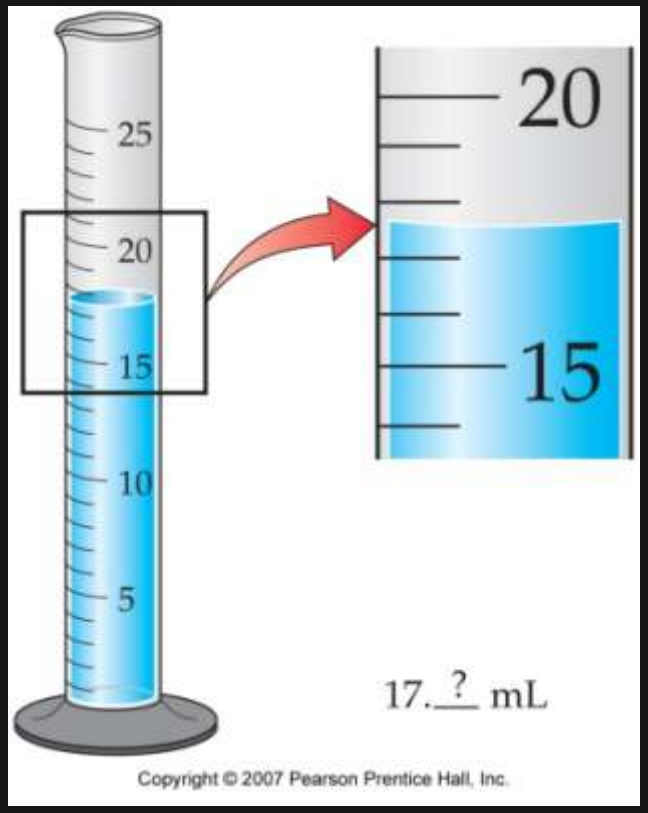
When a measurement is recorded only those digits that are **dependable** are written down.

Every experimental measurement has a degree of uncertainty.

The volume, V, at right is certain in the 10's place, 10mL<V<20mL

The 1's digit is also certain, 17mL<V<18mL

A best guess is needed for the tenths place.



Another Example

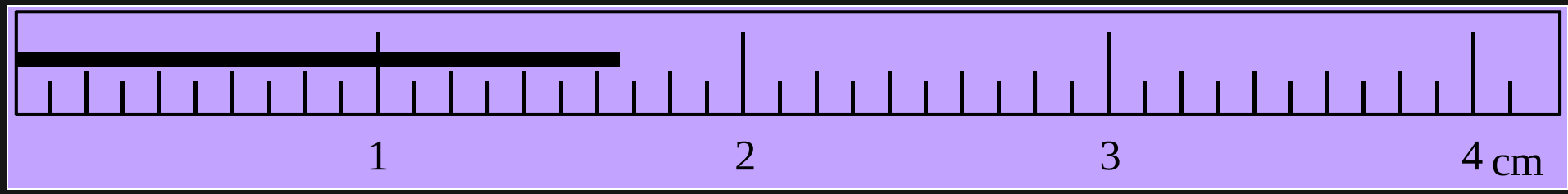
We can see the markings between 1.6-1.7cm

We can't see the markings between the 0.6-0.7

We must guess between 0.6 & 0.7

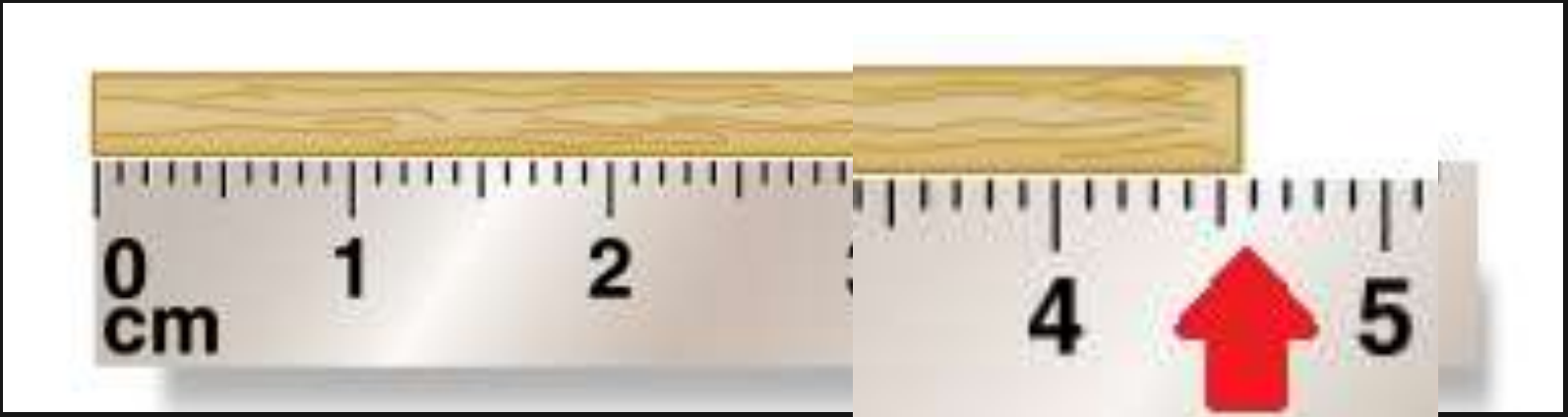
We record 1.67 cm as our measurement

The last digit an 7 was our guess...stop there



Your Turn

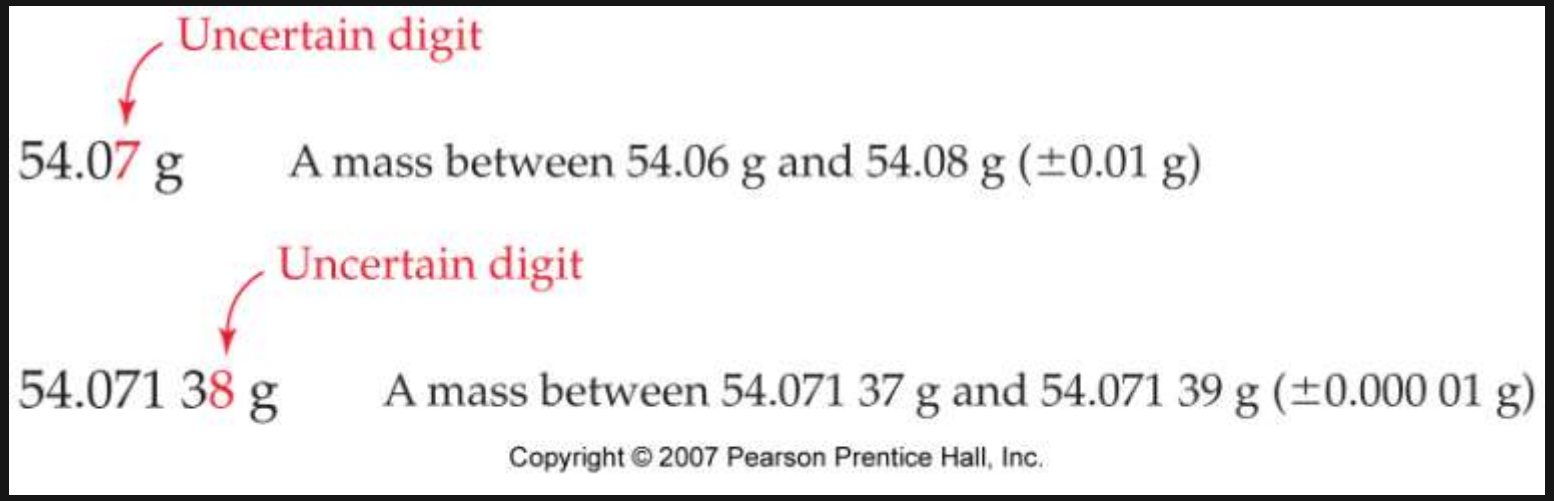
Measured Numbers have error…you have to make that Guess!



What is the length of the wooden stick?

1) 4.5 cm
2) 4.54 cm
3) 4.547 cm

Recorded Numbers



All but one of the significant figures are known with certainty. The last sig. fig. is only to the best possible estimate.

To indicate the precision of a measurement, the value recorded should use all the digits known with certainty.

The Rules

RULE 1. Zeros in the middle of a number are like any other digit; they are always significant.

Ex. 45.081 g has five significant figures.

RULE 2. Zeros at the beginning of a number are *not* significant; they act only to locate the decimal point.

Ex. 0.0537 cm has three significant figures, and 0.069 01 mL has? **4**

The Rules cont.

RULE 3. Zeros at the end of a number and *after* the decimal point are significant. It is assumed that these zeros would not be shown unless they were significant.

Ex. 527.700 m has six significant figures.

If the value were known to only four significant figures, we would write 527.7 m.

The Rules cont.

RULE 4. Zeros at the end of a number and *before* an implied decimal point may or may not be significant. We cannot tell whether they are part of the measurement or whether they act only to locate the unwritten but implied decimal point.

Ex. 280 000km has 2 sig. figs.

How Many Sig Figs?

a. 45.8736

b. 0.000239

c. 0.00023900

d. 48000.

e. 48000

f. 3.982×10^6

g. 1.00040

Scientific Notation

When ever you are unsure – convert to scientific notation

$$215. = 2.15 \times 10^2$$

Decimal point is moved two places to the left, so exponent is 2.

$$3.7962 \times 10^4 = 37{,}962$$

Positive exponent of 4, so decimal point is moved to the right four places.

$$1.56 \times 10^{-8} = 0.000\,000\,015\,6$$

Negative exponent of –8, so decimal point is moved to the left eight places.

Practice

1. Indicate how many significant figures there are in each of the following measured values.

246.32	5 sig figs	1.008	4 sig figs	700000	1 sig fig
107.854	6 sig figs	0.00340	3 sig figs	350.670	6 sig figs
100.3	4 sig figs	14.600	5 sig figs	1.0000	5 sig figs
0.678	3 sig figs	0.0001	1 sig fig	320001	6 sig figs

2. Calculate the answers to the appropriate number of significant figures.

32.567	246.24	658.0
135.0	238.278	23.5478
+ 1.4567	+ 98.3	+ 1345.29
169.0	**582.8**	**2026.8**

3. Calculate the answers to the appropriate number of significant figures.

a) 23.7 x 3.8	= **90.**	e) 43.678 x 64.1	= **2.80×10^3**
b) 45.76 x 0.25	= **11**	f) 1.678 / 0.42	= **4.0**
c) 81.04 g x0.010	= **0.81**	g) 28.367 / 3.74	= **7.58**
d) 6.47 x 64.5	= **417**	h) 4278 / 1.006	= **4252**

Adding and Subtracting

Rule: When adding or subtracting measured numbers, the answer can have no more places after the decimal than the **Least** of the measured numbers.

Practice

5.45cm + 2.3cm = 7.75cm,
Round off to = 7.8cm

You try:
7.432cm + 2cm =
9.432 round to → 9cm

Multiplications and Division

Rule: When multiplying or dividing, the result can have no more significant figures than the **least** reliable measurement.

Practice

56.78 cm x 2.45cm = 139.111 cm^2

Round to → 139cm^2

75.8cm x 9.6cm = ?

Bell Work
1-Sept-2016 Pre - AP

What was the time you calculated to count $\$1 \times 10^6$?

Was this a realistic number? Why?

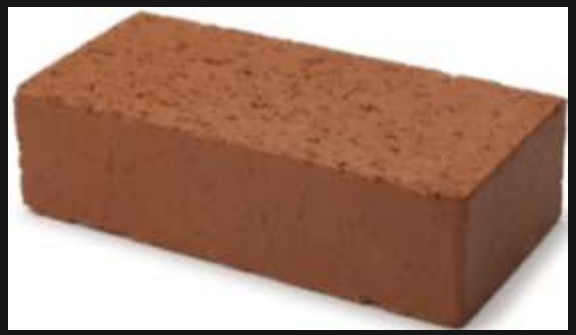
Objective

You will be able to determine the density of a metal after finding its mass and volume.

You will learn a fast method for finding volume.

Volume

How do you get the volume of a brick?

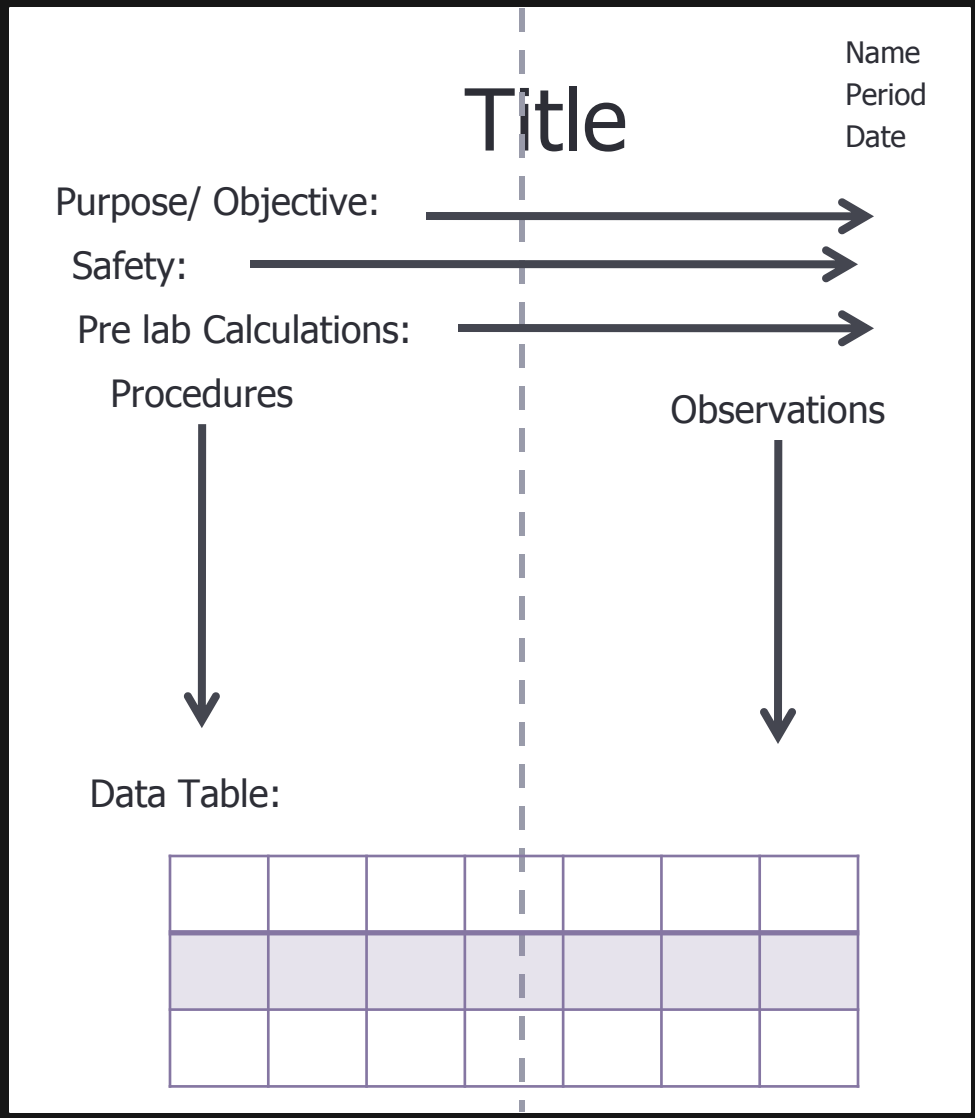


What about a rock?

Pre Lab

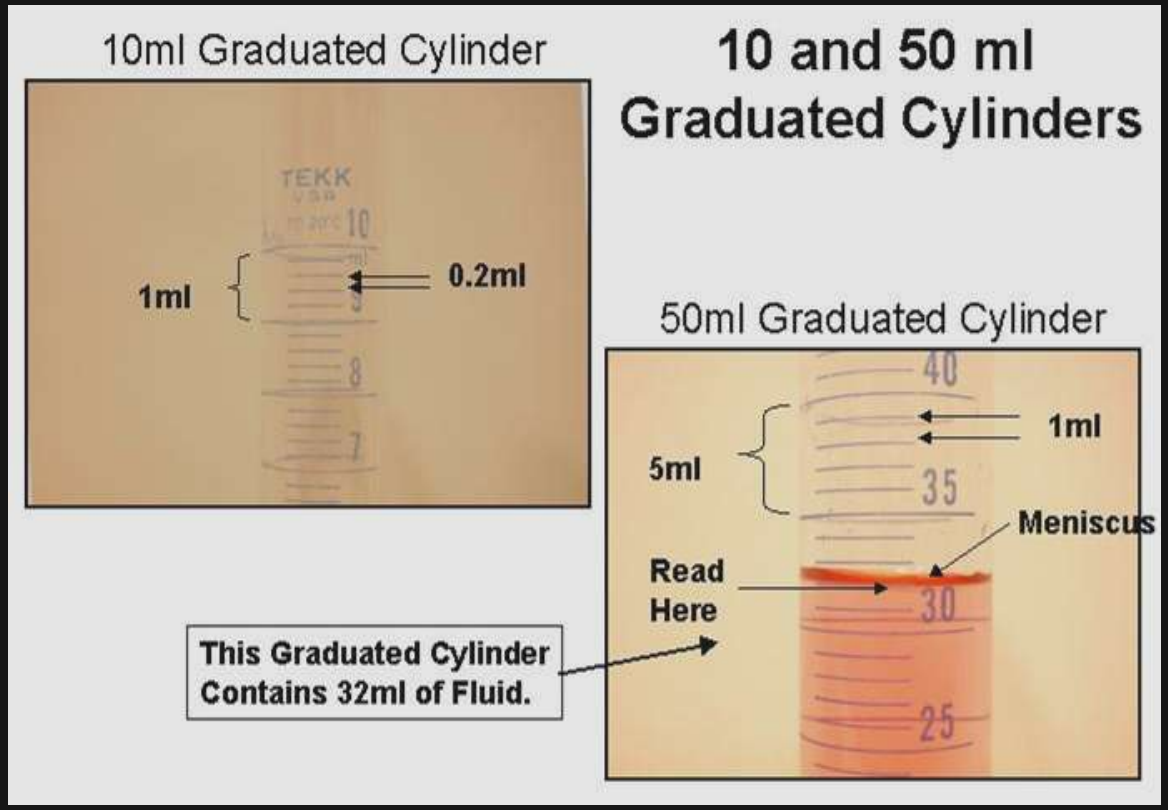
Use as many piece of paper as you need, try not to write on both side.

Analysis and conclusions should be recorded at the end of the pre lab after the lab



Reading a Graduated Cylinder

What do you think is the volume of the solution in your graduated cylinder?



Bell work
2-Sept-2016

How will you obtain mass of your samples?

List the specific steps needed to obtain the volume of the samples in the lab.

Density Lab

There are eight (8) different metals, A-H, you will work each and rotate through the lab

Each metal type needs a minimum of three (3) different samplings of volume and mass.

Dry metals before weighing, all sphere metals use weigh boats

Density Lab

Safety: **Do Not** touch the lead, Pb, with your fingers or hand. No Toces El Plomo

When using the Pb / "G" use 15 balls at a time.

So 15, 30, 45, ____ etc. when measuring

Follow directions!

When finished, record data on board for class to copy down for graphs.

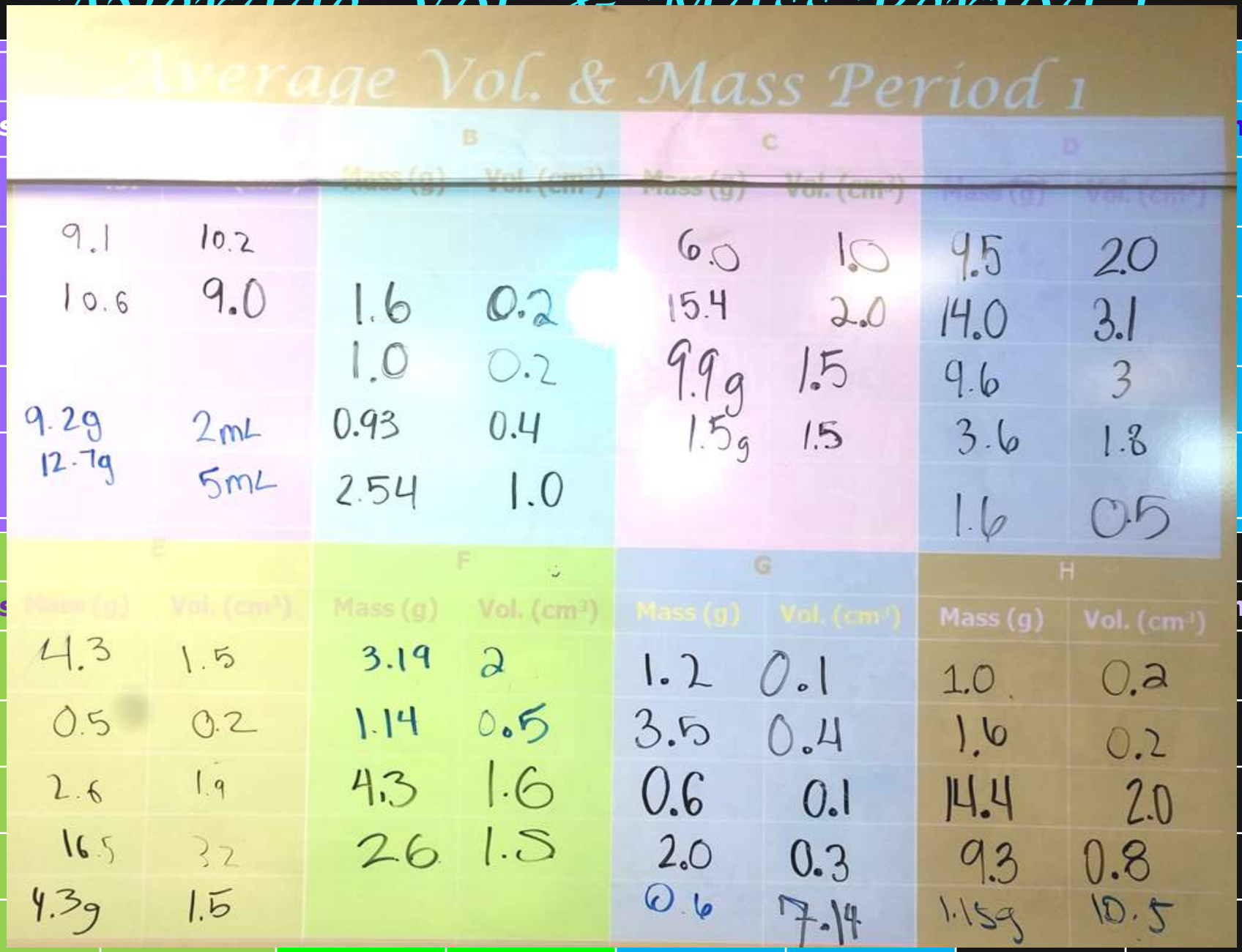
Actual Density Values for percent Error

1. Person from each group:

Please come up to board and enter any *one* of your values you measured for each sample

2. Take a picture or look up data on class website in power point section

Average Vol. & Mass Period 1



		B		C		D	
		Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)
9.1	10.2			6.0	1.0	9.5	2.0
10.6	9.0	1.6	0.2	15.4	2.0	14.0	3.1
		1.0	0.2	9.9g	1.5	9.6	3
9.2g	2mL	0.93	0.4	1.5g	1.5	3.6	1.8
12.7g	5mL	2.54	1.0			1.6	0.5

E		F		G		H	
Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)
4.3	1.5	3.19	2	1.2	0.1	1.0	0.2
0.5	0.2	1.14	0.5	3.5	0.4	1.6	0.2
2.6	1.9	4.3	1.6	0.6	0.1	14.4	2.0
16.5	3.2	2.6	1.5	2.0	0.3	9.3	0.8
4.3g	1.5			0.6	7.14	1.15g	10.5

Average Vol. & Mass Period 2

A		B		C		D	
Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)
9.2	4.0	2.54 g	1.0 cm³	38.9	4.0	16.0	4.0
221.0	10.0	5.7 g	2.1 cm³	18.5 g	2.0 cm³	13.4	2.8
3.4	2.0	0.6 g	0.1			9.5	2.0
9.2	2.0	1.46	0.3	52.2 g	5.2	4.1 g	3.0 cm³
41.6	18.0	1.44	0.6	122.5 g	15	15.6 g	3.0 cm³

E		F		G		H	
Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)
13.6	5.3	3.39	1.1	112.3	15.0	1.9	1.5
8.6 g	6 cm³	19.96	9.6	1.2	0.2	16.5	2.0
5.1 g	3.0 cm³	6.72	0.6	0.2	0.1	0.4 g	0.1 cm³
11.2 g	5.0 cm³	10.99	3.1	111.9	10.1	10.2 g	0.7 cm³
				3.5 g	1.0 cm³		

Average Vol. & Mass Period 3

27.7g	7.0cm³	0.84g	0.3 cm³	13.10g	1.5mL	16.0g	3.0cm³
1.4g	0.9cm³	4.84g	1.4 cm³	28.5g	3.2mL	1.3g	0.10cm³
9.2g	4cm³	24.74g	10 cm³	7.2g	0.9cm³	25.5g	6.3mL
27.6g	12cm³	2.58	1.0	23g	0.6cm³	15.2g	4.1mL
9.2g	1 cm.³					16.0g	4mL
36.9g	16 cm.³					9.5g	2mL

Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)	Mass (g)	Vol. (cm³)
10.2g	7.8 mL	13.31g	4.5 cm³	1.8g	0.1mL	16.3g	4.1 cm.³
7.6g	5.0 mL	42.91g	15 cm³	5.7g	0.4mL	44.9g	5.5 cm.³
4.3g	1.6cm³	14.13g	4.8cm³	8.3g	8.3 cm³	23g	8.2cm³
1.5g	1cm³	10.99	3.1	3.5	1.0	10.2	0.7
2.0g	1 cm.³						
9.3g	3.5 cm.³						

Before you leave…

What laboratory tool could you use to find the volume of a metal nut?

How would you carry out the measurement?

What should you be sure to do to insure the volume is measured correctly?

When finished record data on board for class to copy down for graphs.
Email graph to: william.golden@fwusd.org
Subject: P.X.LastName.FirstName.Density

Actual Density Values for percent Error

A: $CuSO_4$ 8.05g/cm^3

B: Al 2.7g/cm^3

C: Ni 8.90g/cm^3

D: FeS_2 5.02g/cm^3

E: Granit 2.7 g/cm^3

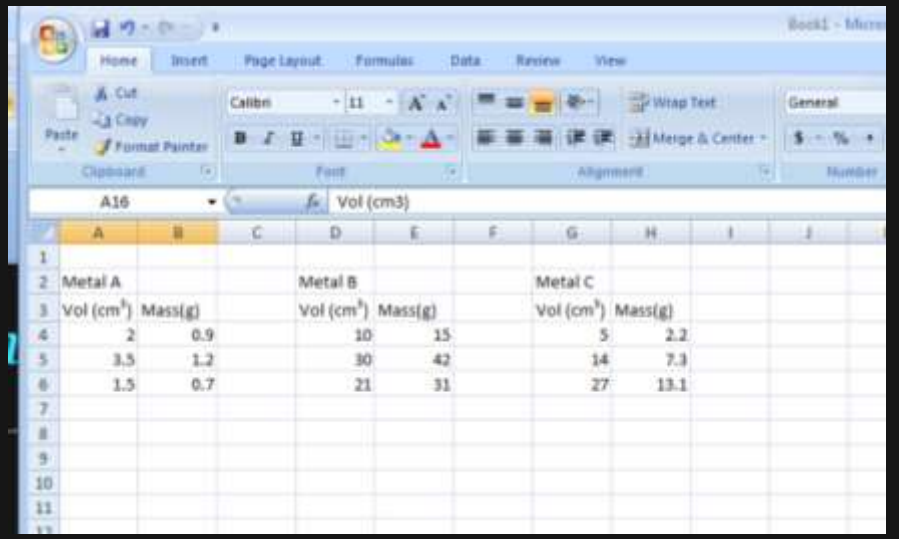
F: Fluorite g/cm^3

G: Cu 8.96g/cm^3

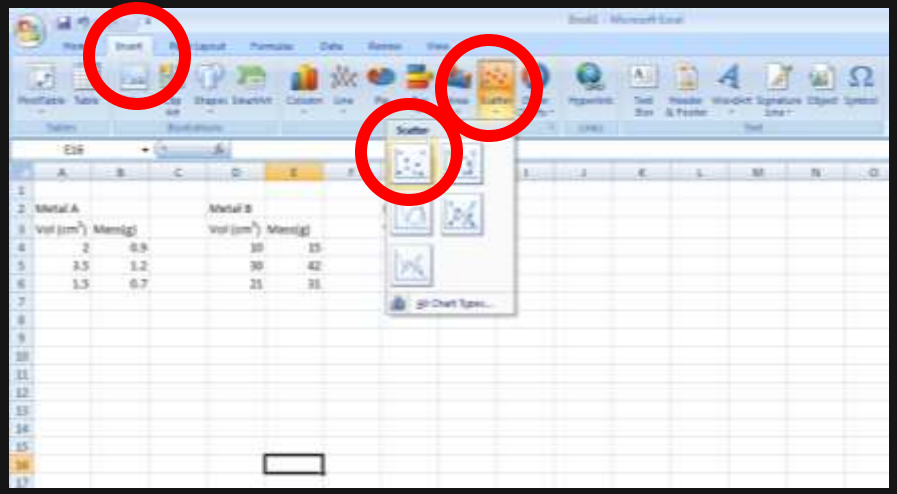
H: Pb 11.34g/cm^3

Making your Graph

1. Enter you data in the spread sheet.

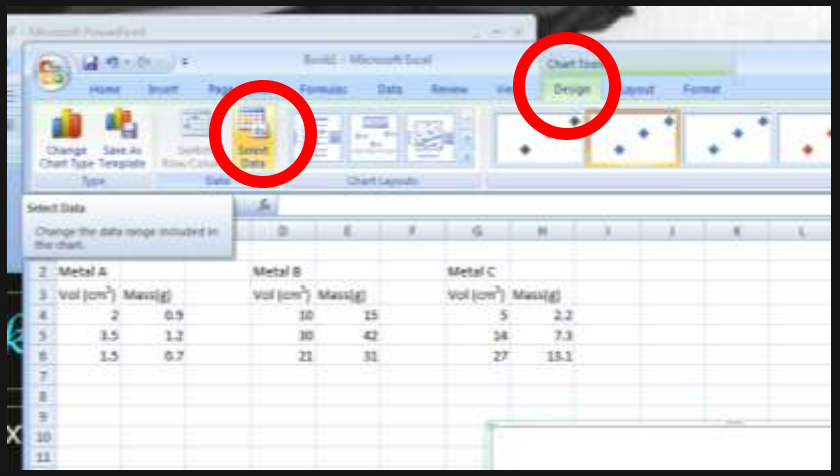


2. Go to the "Insert" tab and select "Scatter"

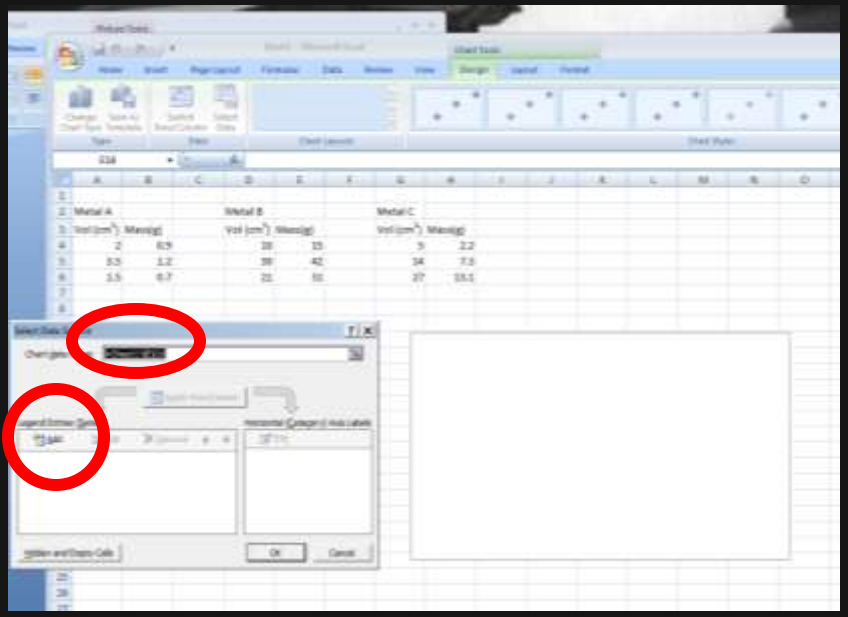


Graph Cont. 2

3. Select "Design" then "Switch Data"

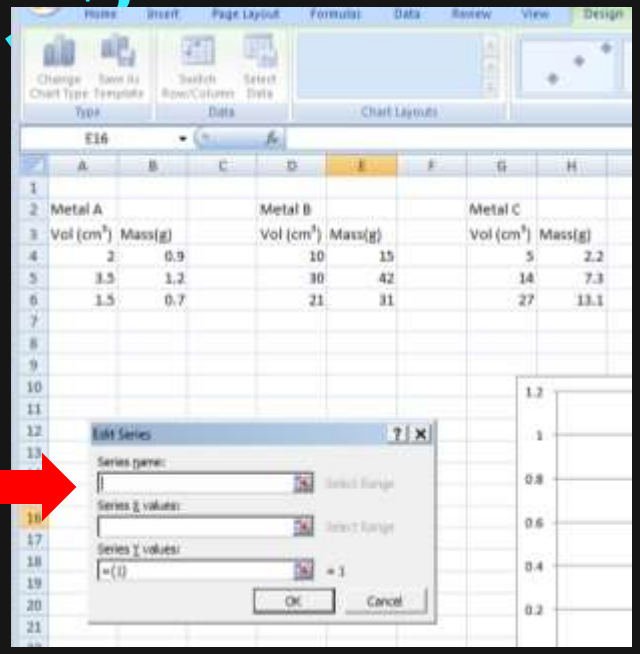


4. Clear Chart Range, and click "Add"

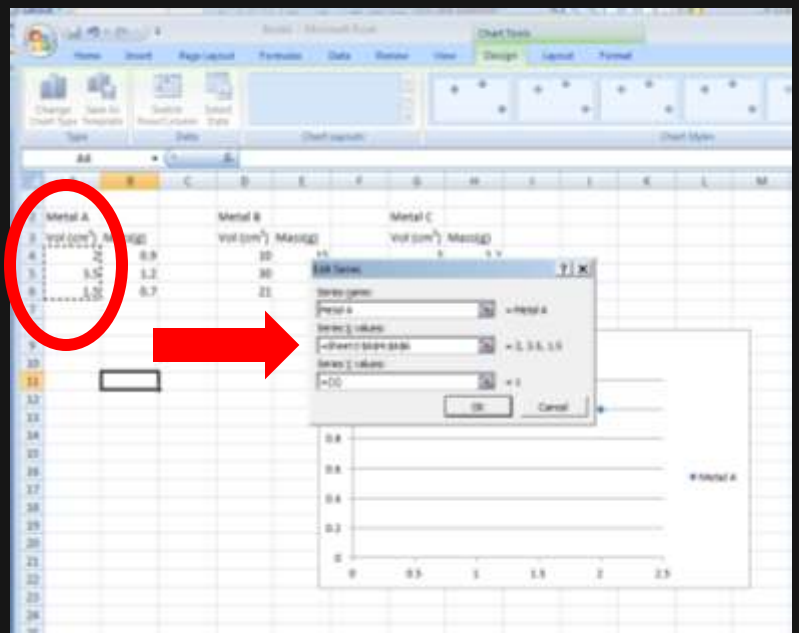


Graph Cont.2

5. Type in Series name

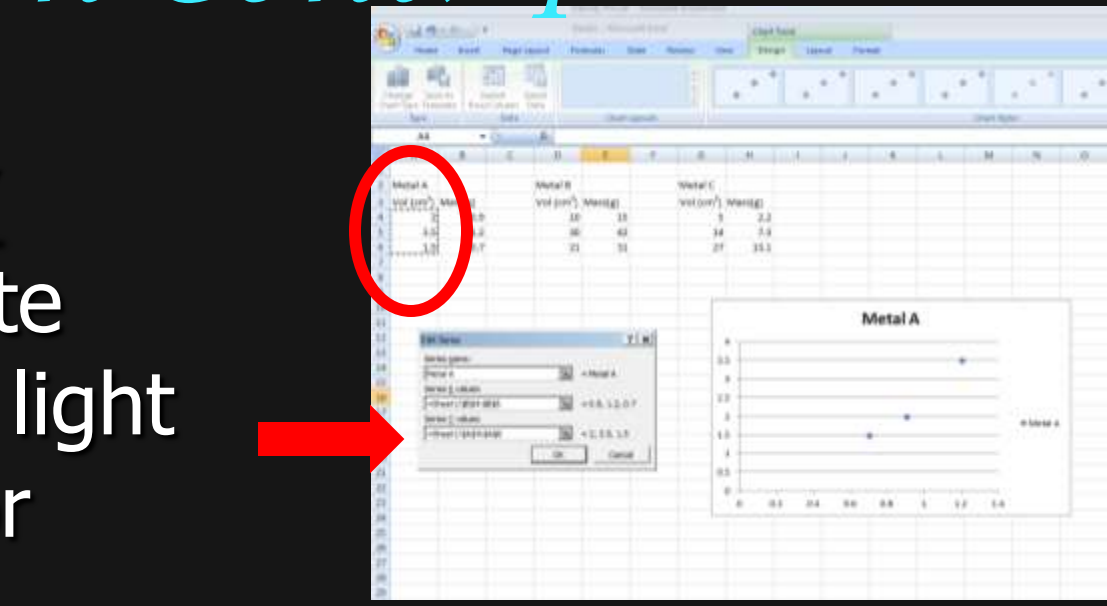


6. Click in "Series X values" and then high light the x-axis data for metal A

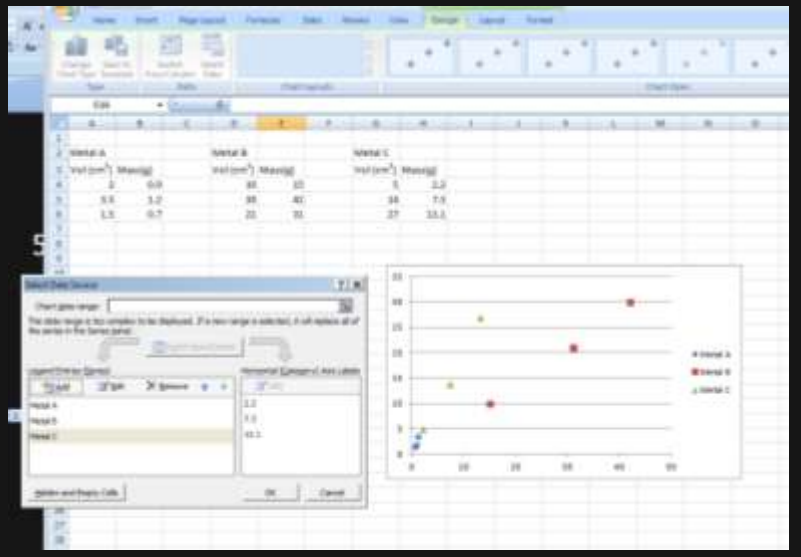


Graph Cont. 4

5. Click in "Series Y values" and, delete "={1}" then high light the y-axis data for metal A

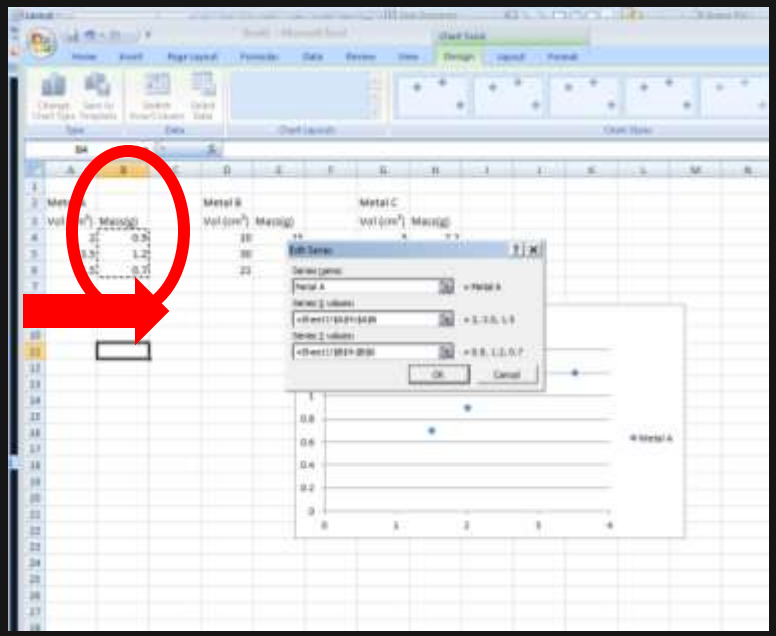


6. Repeat steps 4-6 for each metal



Graph Cont. 5

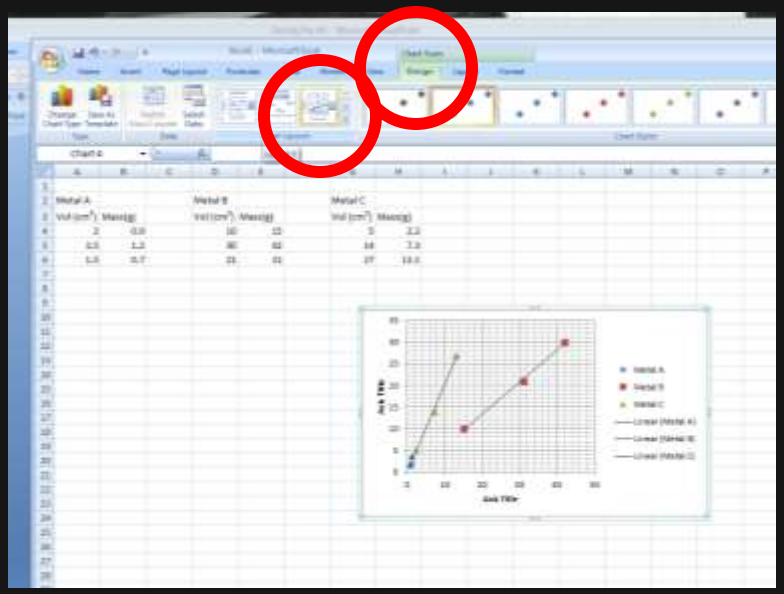
5. Click in "Series Y values" and then high light the y-axis data for metal A



6. Repeat steps 4-6 for each metal

Graph Cont. 6

7. Click on chart then "design", and pick "layout 3"



8. Fill in Axis titles and Chart title, you can calculate slope manually Or using excel "=SLOPE()" formula

Email Your Graphing

Save as: PX.Lastname.Firstname.Density

Email graph to: william.golden@fwusd.org

Subject: PX.Lastname.Firstname.Density

Must be in exact form or No credit.

Each person needs to send graphs

Due by 4:00pm Tuesday 8-Sept-2015